



Docket No. LAR50-001

**UNITED STATES PATENT APPLICATION**

**of**

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**for an**

**ENDODONTIC INSTRUMENT**

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## **TITLE**

Endodontic Instrument

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

- 5 [0001] This application is a continuation in part of, and claims priority to, U.S. Application No. 10/690,421, Publication No. US 2005-0084818 A1.

### **TECHNICAL FIELD OF THE INVENTION**

- [0002] This invention relates to endodontic tools, especially a holder for an endodontic file.

### **BACKGROUND OF THE INVENTION**

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- [0003] In order to preserve a tooth that has diseased pulp material therein, it is necessary to prevent bacterial proliferation within the pulp canal of the tooth by removing the diseased or necrotic pulp material from the pulp cavity or root canal. After pulp material has been removed or extirpated from a tooth, the pulp cavity or root canal is typically filled or obturated with an inert material in order to prevent future infection of the tooth root. This procedure is referred to as root canal therapy.

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- [0004] During root canal therapy, it is essential that the entire root canal be cleaned and filled to eliminate all organic matter contained within the root canal. The typical method for root canal therapy is to open the tooth to the pulp chamber and then find each canal orifice opening and work a small endodontic file down to the root end of the tooth. This small file is worked up and down the canal to create a smooth path, clear pulp tissue debris, and start the canal preparation. This initial root preparation is critical to the success of the treatment. This initial preparation of the canal serves as a "glide path" or "pilot hole" for all the other manual or mechanical instruments with files or bits to enlarge this initial preparation of the root canal to a finish prepared shape.

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- [0005] The root canal system of a human tooth is often narrow, curved, and calcified. It can be extremely difficult to negotiate or clean. Posterior teeth, molars, and premolars can be even more difficult to treat because of the limited room or space in which to operate. The mechanical manipulation the endodontic files in cleaning out the canals in this small limited space can become tedious in preparing the proper "glide path" preparation.

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[0006] Conventional dental instruments used during root canal therapy—such as various endodontic file instruments—generally include a thin, flexible, metal shaft or file with an abrasive surface or sharp edges, which enables efficient cleaning of the root canal. A small, elongated plastic grip handle or hub end is attached at one end of the file instrument and is conventionally adapted for gripping by the dentist with the thumb and index finger in a “two-finger” grip.

[0007] The small, elongated plastic grip of these files mostly have a common dimensional hour glass shape. Most dental manufactures have maintained the uniformity of these grips which are standard in clinical endodontic instruments.

[0008] The “two-finger” grip is mostly unique in dentistry for holding the endodontic file instrument. Almost all other working operative instruments in dentistry are held by a long handle in a full hand pencil grip or “pen-grasp-grip.” For example the dental mirror, dental explorer, scaler, periodontal probe, material placing instrument, and others all have long handles which the dentist uses in the “pen-grasp-grip” or pencil grip.

[0009] Of additional interest is the fact that all of these dental tools mentioned have built into their design a “dental angle”. This “dental angle” allows better access and visibility to the tooth surfaces being examined, when cavities are filled, or teeth are being cleaned. For example: the dental mirror is angled for better access to see the various surfaces of the teeth, especially the posterior teeth. The dental explorer, scaler, periodontal probe, and material placing instrument all use the “dental angle” for the same reason, better access and better visibility in operating the instrument.

[0010] On the other hand, the conventional “two-finger” grip on the small handle of an endodontic file does not lend itself to having a built-in “dental angle.” The file is held by the dentist in a vertical straight line position to operate. With the files measuring 25 to 35 millimeters in length, the placement of these files into the canal and the working of these files with the conventional “two-finger” grip can be tedious and time consuming. Accessing molar and premolar teeth can be difficult most cases.

[0011] Visibility to see the canal orifice so as to place the file is also very difficult when holding the file in the conventional file grip. The dentist’s fingers holding the file, obstruct the view into the pulp chamber and the small orifice of the canal into which the file is to be placed.

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[0012] The problems with the conventional manner of gripping an endodontic file in root canal therapy, especially in molars and premolars are numerous. With the limited space to do the root canal procedure, the "two-finger" endodontic file grip hinders the visibility to find the canals. The dentist's fingers holding the file obstruct the field of view to the canals. It is difficult access and treat these cases with the conventional grip on the file.

[0013] Molar and premolar teeth usually require multiple filing motions even a hundred or more cycles of motion in preparing the initial "glide path." The filing manipulation in molar and premolar teeth can be very tedious and tiring to the dentist and the patient. The dentist fingers have to be positioned over the tooth to work the file in the canal. Many times in treating molars and premolar it requires the patient to stretch open as wide as possible for quite some time.

[0014] Accordingly, there is a need for an improved endodontic device that overcomes or avoids the above problems, among many others. Holding the standard endodontic file in a pen-grasp-grip or pencil grip gives the dentist secure control of the file. An unsecured or slippery file grip can lead to error and injury.

#### BRIEF SUMMARY OF THE INVENTION

[0015] Therefore, an innovative endodontic instrument is provided which comprises, among other features: a handle having an elongated base with a threaded projection at a first end, the projection having a recessed distal surface capable of cupping a first terminus portion of an elongated plastic grip attached to an endodontic file; and a cap containing a channel extending through a first end of said cap with a first portion of the channel being threaded for mating with the projection of the elongated base of said endodontic instrument handle, said cap possessing a side, and said cap also having a second end containing an aperture through which an endodontic file can project, the diameter of the aperture being selected to be larger than the diameter of the endodontic file but smaller than the diameter of a plastic grip attached to the endodontic file, said cap further having a recessed interior surface capable of cupping a second terminus portion of an elongated plastic grip attached to an endodontic file. This instrument helps prevent the problems noted above, including awkward access angles and unsecured or slippery file grip that can lead to loss of control of the endodontic file during the root canal procedure and the possibility of swallowing or inhalation of the uncontrolled endodontic file leading to serious injury.

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### **BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**

- [0016] FIG. 1 is a side view of an endodontic file in one embodiment of the invention.
- [0017] FIG. 2 is a side view of the handle and cap in one embodiment of the invention.
- [0018] FIG. 3 is a cross-section, exploded view of the handle, endodontic file, and cap in one embodiment of the invention.
- [0019] FIG. 4 is a cross-section of the handle, endodontic file, and cap in one embodiment of the invention.
- [0020] FIG. 5 is a perspective view of one embodiment of the invention.

### **DETAILED DESCRIPTION OF THE INVENTION**

- [0021] Referring now to Figure 1, an endodontic file **101** is a small, tapered, fluted wire with a tip **102** and to which may be attached an elongated plastic grip **103** with a first terminus portion **104** and a second terminus portion **105**. The file **101** is used in preparing and cleaning the root canal of a tooth. In various embodiments, the first and second terminus portions **104**, **105** of the elongated plastic grip **103** may have distally curving surfaces and/or partially rounded ends.
- [0022] Referring now to Figure 2, the present holder **200** has a handle **201** and a cap **202**.
- [0023] The handle **201** employs an elongated base **203** having a threaded projection **204** at a first end **205**. In various embodiments, the handle **201** has a plurality of longitudinally oriented recessed grooves **211** adjacent to the first end **205** of the elongated base **203** for increasing the handle's grip surface area and for providing rotational control of the instrument when in use. In still other embodiments, the handle has a plurality of transversely oriented recessed grooves **213** on the elongated base **203** for increasing the handle's grip surface area and for reducing longitudinal slippage when in use. Such transversely oriented recessed grooves **213** may be shallower and greater in number than the longitudinally oriented recessed grooves **211**.
- [0024] Preferably, the maximum outer diameter of the cap **202** is substantially the same as the maximum outer diameter of the elongated base **203**.
- [0025] The cap **202** contains a channel **206** extending through a first end **207** of the cap. The first portion **208** of the channel **206** is threaded (not shown) for mating with the projection **204** of the elongated base **203**. The second end **209** of the cap **202** contains an aperture **210** through which an endodontic file **101** can project. In various embodiments, the cap **202** also has a plurality of longitudinally oriented recessed grooves **214** adjacent to the first end **207** of the cap

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202 for increasing the cap's grip surface area and for providing rotational control when in use. In still other embodiments, the cap has a plurality of transversely oriented recessed grooves 215 for increasing the cap's grip surface area and for reducing longitudinal slippage when in use. Such transversely oriented recessed grooves 215 may be shallower and greater in number than the  
5 longitudinally oriented recessed grooves 214.

[0026] Referring now to the cross-section of Figure 3, in various embodiments the threaded projection 204 and cap 202 have surfaces uniquely tailored, partially, and/or substantially complimentary to the distally curving surfaces and/or partially rounded ends of the elongated plastic grip 103 attached to an endodontic file 101. Specifically, the projection 205 of  
10 the elongated base 204 may have a recessed distal surface 301 capable of cupping a first terminus portion 104 of an elongated plastic grip 103 attached to an endodontic file 101. Likewise, the cap 202 may have a recessed interior surface 302, located within the channel 206, and capable of cupping a second terminus portion 105 of an elongated plastic grip 103 attached to an endodontic file 101.

[0027] Referring now to the cross-section of Figure 4, in use, an endodontic file 101 is placed so that it extends through the aperture 210 with the elongated plastic grip 103 that is attached to the endodontic file 101 (at an end 106 opposite to the tip 102) being in the channel 206. (The diameter of the aperture 210 is selected to be larger than the diameter of the  
endodontic file 101 but smaller than the diameter of the elongated plastic grip 103.) The cap 202  
20 is then screwed closer to the first end 205 of the elongated base 203 until the elongated plastic grip 103 is securely retained in the channel 206 between the second end 209 of the cap 202 and the projection 204, as a result of the recessed distal surface of the projection 301 cupping the first terminus portion 104 of the plastic grip 103 and the recessed interior surface 302 of the cap 202 cupping the second terminus portion 105 of the plastic grip 103 through a compression fit  
25 achieved from the mating of the elongated base 203 and cap 202.

[0028] As a result of this configuration, including the surfaces 301 and 302 of the threaded projection 204 and cap 202 being uniquely tailored, partially, and/or substantially complimentary to the distally curving surfaces and/or partially rounded ends of the elongated plastic grip attached to an endodontic file, the elongated plastic grip 103 is securely maintained  
30 by maximizing surface area contact between parts during the mating of the elongated base 203 and cap 202 and consequent compression fit. Indeed, when so securely maintained, the tip of the

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endodontic file **102** is not capable of being variably positioned within the instrument along the Y axis due to the compression fit.

[0029] Referring now to Figure 5, a closer perspective view of the elongated plastic grip **103** within the channel illustrates the manner of fitting and structure within one embodiment of the invention.

[0030] In order to facilitate the work of an endodontist, an option to the present invention is, as portrayed in Figure 4, an endodontic file **101** that initially moves away from the centerline of the endodontic file **101** in a first direction shown by the arrow A and then curves back toward and crosses the centerline as the tip **102** of the endodontic file **101** is approached but does not then again cross the centerline.

[0031] Referring back to Figure 2, in order to accommodate such a bent endodontic file **101**, the aperture **210** is extended to the side **216** of the cap **202** and, on such side **216**, enlarged to dimensions sufficient to permit the introduction into the channel **206** of the elongated plastic grip **103**.

[0032] The instrument aids the dentist by changing the thumb-and-finger grip to a secure pencil-type grip, which is more suitable for manipulating the endodontic file **101**. And the bent endodontic file **101** permits the dentist to place his or her hand in a more convenient location.

[0033] As used herein, the term "substantially" indicates that one skilled in the art would consider the value modified by such terms to be within acceptable limits for the stated value. Also as used herein the term "preferable" or "preferably" means that a specified element or technique is more acceptable than another but not that such specified element or technique is a necessity.

[0034] The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.